



## Knowledge and Awareness Level of Cardiovascular Diseases and Their Risk Factors among The Saudi Population

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**Abstract Introduction:** This article discusses cardiovascular diseases and their risk factors. Cardiovascular diseases are a broad term that is involved in all diseases of the heart and blood vessels. For example, myocardial infarction, stroke and angina. Several studies have been done on this topic in Saudi Arabia covering Acute coronary syndrome and myocardial infarction in knowledge, awareness and attitude levels. There are many risk factors for cardiovascular disease, such as smoking, unhealthy food, hypertension, diabetes, poor exercise and obesity. Cardiovascular diseases are a worldwide issue, almost a third of all deaths globally from cardiovascular diseases. So, it is important to raise knowledge and awareness about cardiovascular diseases to reduce the number of deaths and increase life expectancy. **Objective:** The study aimed to assess the level of knowledge and awareness of cardiovascular diseases and their risk factors among the Saudi population. **Methodology:** This is an observational cross-sectional study conducted between July 2024 to February 2025 in Saudi Arabia. The study involved distributing the questionnaire form online to people in the Kingdom of Saudi Arabia to assess the population's knowledge and awareness of cardiovascular diseases and their risk factors. The inclusion criteria are males and females in the Kingdom of Saudi Arabia who are 18 years old or older. Excluded individuals who were younger than 18 years and not in Saudi Arabia. The Raosoft sample size calculator was used to calculate the sample size. The minimum target sample size that was determined is 384, with an indicator percentage of 0.50, a margin of error of 5% and a confidence interval (CI) of 95%. **Results:** The study included a sample of 432 Saudi participants. The findings indicate that 74.5% of respondents possess a high level of awareness regarding CVD, with 85.4% correctly identifying hypertension and 94.2% recognizing smoking as a risk factors. However, 26.4% were uncertain about diabetes' role, highlighting a knowledge gap. Additionally, nearly half (48.8%) exhibited high knowledge levels, yet 51.2% demonstrated moderate to low understanding, emphasizing the need for targeted educational interventions. Significant relationships were noted between awareness and educational levels, as well as knowledge and marital status. **Conclusion:** our study highlights crucial gaps in the knowledge and awareness of cardiovascular diseases among the Saudi population. Although awareness of certain risk factors appears high, the depth of knowledge remains insufficient to translate this awareness into effective personal health behavior modifications.

**Key Words** Knowledge, Awareness, Cardiovascular diseases, Risk factors, Saudi Arabia

### INTRODUCTION

Cardiovascular disease is a general term that refers to all disorders affecting the heart and blood vessels, such as stroke, coronary artery disease or aortic disease [1]. Damage to the heart and circulatory system is the primary cause of

cardiovascular diseases [2]. Cardiovascular conditions are the most common cause of mortality worldwide, contributing to roughly 30 percent of all fatalities [3]. Some conditions are known risk factors, including abnormal levels of lipids, high fasting plasma glucose level, systolic hypertension, kidney

dysfunction and an elevated BMI [4]. The main lifestyle risk factors such as eating unhealthy food, inactivity, smoking and heavy consumption of alcohol [5]. Saudi Arabia experienced substantial urbanization in the past few years, which has raised the CVD rate [6].

Cardiovascular disease (CVD) and related morbidity are becoming more common and this is increasingly seen as a global issue. Thirty percent of deaths globally are thought to be caused by cardiovascular diseases [7]. Globally, the prevalence of cardiovascular disease (CVD) has increased to epidemic proportions [8]. Sudden, often deadly, myocardial infarction and stroke are examples of life-threatening cardiovascular events [9].

A study with 1172 participants that took place in Hail, Saudi Arabia, was published in 2022. Regarding all types of CVDs, most participants recognized congenital heart disease (53.4%) and coronary heart disease (74.5%) but most did not associate rheumatic heart disease or deep vein thrombosis/pulmonary embolism with CVDs. Regarding the symptoms and signs of myocardial infarction, just over half of the participants correctly identified shortness of breath (59.8%) and chest discomfort and pain (65.7%) [10]. In 2019, a study was published in Riyadh, the capital of Saudi Arabia, involving 388 participants. 13.9% of those who participated were aware that cigarette smoking is an increased risk factor for cardiovascular disease, while 6.4% were familiar with elevated blood pressure as well as elevated blood cholesterol levels, 5.4% were aware of overweight and obesity and 4.1% were aware of DM and family history. When asked if not exercising was a risk factor, 72% of participants said "yes" [11]. A recent article with 395 participants was published in 2024 in Jeddah. The study's participants exhibited an impressive degree of knowledge of the risk factors associated with cardiovascular disease, such as smoking, obesity, high cholesterol, unhealthy eating patterns and a lack of physical activity. Nevertheless, there was a clear lack of knowledge about DM and anxiety. In general, the mean knowledge score was 16.33 out of 25 [12].

Our study aims to evaluate Saudi citizens' understanding of cardiovascular diseases and any shortcomings in public health policy and education.

## Objectives

The study aims to assess the level of knowledge and awareness of cardiovascular diseases and their risk factors among the Saudi population.

## METHODS

### Study Design and Setting

This is an observational cross-sectional study was followed STROBE guidelines, conducted between July 2024 to February 2025 in Saudi Arabia. The study's population consisted of Saudi adults.

### Sample Size

To guarantee that the sample size is representative of the entire population, the bare minimum of responders was determined. The Raosoft sample size calculator was used to calculate the sample size. The sample size that was

determined is, 384 with an indicator percentage of 0.50, a margin of error of 5% and a Confidence Interval (CI) of 95%.

## Inclusion and Exclusion Criteria

The study involved distributing the questionnaire form online to people in the Kingdom of Saudi Arabia aged 18 years and above to assess the population's knowledge and awareness of cardiovascular diseases and their risk factors. Males and females in the Kingdom of Saudi Arabia from the age of 18 years and above were included. Individuals who were younger than 18 years and not in Saudi Arabia were excluded from this study.

## Method for Data Collection and Instrument

A structured questionnaire has been used as a research tool. This tool was developed based on relevant Saudi studies [11,13]. The questionnaire has four sections and 34 statements in total. The first section is the demographic and clinical characteristics of participants and includes 17 statements. The second section is about awareness regarding risk factors of CVD and includes 9 statements. The third section, Knowledge regarding the clinical picture of CVD, includes 3 statements. The fourth section, Knowledge towards prevention of CVD, includes 5 statements.

## Scoring System

In all, 34 statements served to evaluate the level of knowledge and awareness. 17 statements for demographics and clinical characteristics, 8 for knowledge and 9 for awareness. One point is given for correct answers and zero points are given for incorrect answers or "not sure". We used the scoring system of the original Bloom's cut-off points. The participants were divided into three groups based on their scores.

Demographic and clinical characteristics: 17 statements given for them, 0 Points.

Knowledge score varied from 0 to 9 points and was classified into three levels as follows: those with a score of 5 or below ( $\leq 5$ ) were classified as having a low level of knowledge, those with scores 6 as having a moderate level of knowledge and those with scores 7 or above ( $\geq 7$ ) as a high level of knowledge.

Awareness scores varied from 0 to 9 points and were classified into three levels as follows: those with a score of 5 or below ( $\leq 5$ ) were classified as having a low level of awareness, those with scores of 6 as having a moderate level of awareness and those with scores of 7 or above ( $\geq 7$ ) as having a high level of awareness.

## Pilot Test

The questionnaire was delivered to 20 people and asked them to complete it. This was done to test the questionnaire's simplicity and viability for the study. The data from the pilot study was omitted from the study's results.

## Analysis and Entry Method

Data was entered on a computer with the "Microsoft Office Excel Software" (2016) for Windows. The data was then transferred to the IBM SPSS Statistics for Windows, Version 20.0 (Armonk, NY: IBM Corp.) program for statistical analysis.

## RESULTS

Table 1 displays various demographic parameters of the participants with a total number of (432). Notably, the mean age within the sample is 35.8 years, with a standard deviation of 14.0, suggesting a relatively diverse age range, which is further substantiated by the distribution where a significant portion of participants (27.5%) are over the age of 45, while 26.4% are under 23. Gender representation tilts considerably toward females, who constitute 69.9% of the sample, indicating a potential gender imbalance in the data collection process. In terms of marital status, the majority are married (53.7%), followed by singles (41.0%), which could influence the social dynamics within the group. The occupational landscape reveals that a substantial portion of participants are employed (40.5%), while a noteworthy segment identifies as students (32.4%). Educationally, the data highlights a predominance of individuals holding a bachelor's degree (67.1%), indicating a highly educated cohort, potentially influencing their socio-economic perspectives. Geographically, the distribution reflects a majority residing in the Eastern (41.2%) and Western (34.5%) regions, which could reflect regional socioeconomic factors impacting this group. Importantly, a significant 68.3% of participants categorize their daily life as moderate in terms of stress, underscoring the need to explore the implications of stress management within this demographic. Finally, the low prevalence of smoking (8.3% currently smoking and 3.5% being ex-smokers) suggests generally positive health behaviors in this population.

As shown in Figure 1, among the respondents, a significant portion, totaling 184 individuals, reported that they do not engage in any form of exercise, highlighting a concerning trend towards physical inactivity, which is a well-documented risk factor for cardiovascular conditions. In contrast, 102 participants indicated that they exercise once a week, while 106 individuals reported exercising 2 to 3 times a week and only 40 respondents claimed to engage in physical activity more than five times per week.

As illustrated in Table 2, the findings reveal significant insights into lifestyle habits and health conditions that could

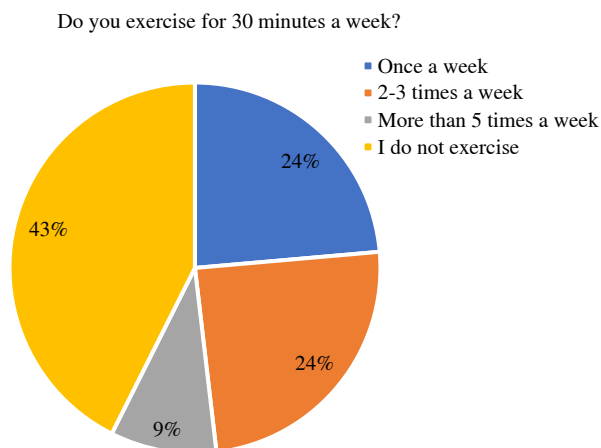


Figure 1: Illustrates exercise frequency among participants

Table 1: Sociodemographic characteristics of participants (n = 432)

| Parameter                 |                     | Number | Percentage |
|---------------------------|---------------------|--------|------------|
| Age (Mean:35.8, STD:14.0) | Less than 23        | 114    | 26.4       |
|                           | 23 to 35            | 106    | 24.5       |
|                           | 35 to 45            | 93     | 21.5       |
|                           | More than 45        | 119    | 27.5       |
| Gender                    | Female              | 302    | 69.9       |
|                           | Male                | 130    | 30.1       |
| Marital status            | Single              | 177    | 41.0       |
|                           | Married             | 232    | 53.7       |
|                           | Divorced            | 14     | 3.2        |
|                           | Widowed             | 9      | 2.1        |
| Occupational status       | Student             | 140    | 32.4       |
|                           | Employed            | 175    | 40.5       |
|                           | Unemployed          | 67     | 15.5       |
|                           | Retired             | 50     | 11.6       |
| Educational level         | Primary school      | 1      | .2         |
|                           | Middle school       | 9      | 2.1        |
|                           | High school         | 110    | 25.5       |
|                           | Bachelor's degree   | 290    | 67.1       |
|                           | Postgraduate degree | 22     | 5.1        |
| Region of residence       | Northern region     | 32     | 7.4        |
|                           | Southern region     | 5      | 1.2        |
|                           | Central region      | 68     | 15.7       |
|                           | Eastern region      | 178    | 41.2       |
|                           | Western region      | 149    | 34.5       |
| Daily life is considered  | Stress-free         | 23     | 5.3        |
|                           | Stressful           | 92     | 21.3       |
|                           | Very stressful      | 22     | 5.1        |
|                           | Moderate            | 295    | 68.3       |
| Do you smoke?             | Yes                 | 36     | 8.3        |
|                           | No                  | 381    | 88.2       |
|                           | Ex-smoker           | 15     | 3.5        |

Table 2: Parameters related to clinical characteristics of participants (n = 432)

| Parameter                                                     |                                                           | Number | Percentage |
|---------------------------------------------------------------|-----------------------------------------------------------|--------|------------|
| Do you exercise for 30 minutes a week?                        | Once a week                                               | 102    | 23.6       |
|                                                               | 2-3 times a week                                          | 106    | 24.5       |
|                                                               | More than 5 times a week                                  | 40     | 9.3        |
|                                                               | I do not exercise                                         | 184    | 42.6       |
| Do you include vegetables and fruits in your daily diet?      | Sometimes                                                 | 287    | 66.4       |
|                                                               | All the time                                              | 127    | 29.4       |
|                                                               | I never eat vegetables or fruits                          | 18     | 4.2        |
| Do you eat fast food frequently?                              | Yes, I do                                                 | 86     | 19.9       |
|                                                               | Sometimes                                                 | 248    | 57.4       |
|                                                               | Rarely                                                    | 58     | 13.4       |
|                                                               | No, I don't                                               | 40     | 9.3        |
| Family history of cardiovascular disease:                     | No                                                        | 288    | 66.7       |
|                                                               | Yes                                                       | 144    | 33.3       |
| Have you been diagnosed with hypertension?                    | No                                                        | 370    | 85.6       |
|                                                               | Yes                                                       | 62     | 14.4       |
| If yes, do you measure your blood pressure regularly?         | No                                                        | 88     | 20.4       |
|                                                               | Yes                                                       | 31     | 7.2        |
|                                                               | I wasn't diagnosed with hypertension as I mentioned above | 313    | 72.5       |
| Have you been diagnosed with Diabetes?                        | No                                                        | 385    | 89.1       |
|                                                               | Yes                                                       | 47     | 10.9       |
| If yes, do you monitor your blood sugar regularly?            | No                                                        | 63     | 14.6       |
|                                                               | Yes                                                       | 41     | 9.5        |
|                                                               | I wasn't diagnosed with diabetes as I mentioned above     | 328    | 75.9       |
| Have you ever been diagnosed with the following conditions? * | Hypertension                                              | 56     | 12.9       |
|                                                               | Diabetes Mellitus                                         | 43     | 9.9        |
|                                                               | High Cholesterol                                          | 70     | 16.2       |
|                                                               | Obesity                                                   | 66     | 15.3       |
|                                                               | Previous Heart Attack or heart disease                    | 5      | 1.1        |
|                                                               | Previous Stroke                                           | 1      | 0.2        |
|                                                               | Never been diagnosed with any of the above                | 276    | 63.9       |

\*Results may overlap

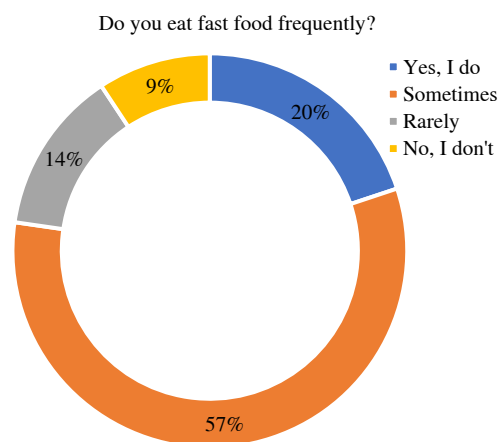


Figure 2: Illustrates fast food consumption among participants

potentially affect cardiovascular risk. Notably, a striking 42.6% of participants reported no engagement in exercise, while only a combined 24.5% exercised two to three times a week, indicating a prevalent sedentary lifestyle that warrants further investigation given its established correlation with various health ailments. Furthermore, dietary habits appear to be more favorable, with 66.4% consuming fruits and vegetables occasionally, although only 29.4% report including them in their daily diet, suggesting room for improvement in nutritional practices. Fast food consumption

also presents a noteworthy concern; 57.4% of respondents indicated they consume fast food occasionally, highlighting a behavioral pattern that could contribute to obesity and other metabolic disorders. On the health front, a majority of participants (66.7%) reported no family history of cardiovascular diseases, which is a positive indicator; however, approximately 14.4% have been diagnosed with hypertension and 10.9% with diabetes. Alarming, among those diagnosed, regular monitoring of blood pressure and blood sugar levels is lacking, as indicated by the sobering statistic that 20.4% and 14.6% of these individuals do not engage in routine monitoring, respectively. Lastly, the high percentage (63.9%) of individuals reporting no prior diagnoses of hypertension, diabetes, high cholesterol, obesity, heart disease or stroke underscores a potentially healthy demographic, albeit one that may be at risk if prevailing lifestyle trends do not improve.

As shown in Figure 2, With a notable majority of respondents indicating that they consume fast food either frequently or sometimes-86 and 248 individuals, respectively-it raises pertinent questions about the impact of such dietary choices on cardiovascular health. The high prevalence of fast-food consumption suggests a potential gap in awareness regarding the nutritional implications and health risks associated with these dietary practices. Furthermore, the relatively low numbers of individuals who either rarely or do not consume fast food-58 and 40 respondents, respectively-may reflect a

Table 3: Participants knowledge and awareness regarding CVD and their risk factors (n = 432)

| Parameter                                                                                          |                                          | Number | Percentage |
|----------------------------------------------------------------------------------------------------|------------------------------------------|--------|------------|
| Hypertension can be a major risk factor for CVD:                                                   | Not sure                                 | 58     | 13.4       |
|                                                                                                    | No                                       | 5      | 1.2        |
|                                                                                                    | Yes                                      | 369    | 85.4       |
| Cigarette smoking is considered a risk factor for CVD:                                             | Not sure                                 | 24     | 5.6        |
|                                                                                                    | No                                       | 1      | .2         |
|                                                                                                    | Yes                                      | 407    | 94.2       |
| Having a positive family history of CVD can be a risk factor for CVD:                              | Not sure                                 | 91     | 21.1       |
|                                                                                                    | No                                       | 22     | 5.1        |
|                                                                                                    | Yes                                      | 319    | 73.8       |
| Elevated blood cholesterol is considered a risk factor:                                            | Not sure                                 | 58     | 13.4       |
|                                                                                                    | No                                       | 6      | 1.4        |
|                                                                                                    | Yes                                      | 368    | 85.2       |
| Diabetes is regarded as a major risk factor for CVD:                                               | Not sure                                 | 114    | 26.4       |
|                                                                                                    | No                                       | 25     | 5.8        |
|                                                                                                    | Yes                                      | 293    | 67.8       |
| Obesity is one of the main risk factors associated with CVD:                                       | Not sure                                 | 43     | 10.0       |
|                                                                                                    | No                                       | 5      | 1.2        |
|                                                                                                    | Yes                                      | 384    | 88.9       |
| Do you think that a poor exercise regimen increases the risk of cardiovascular disease?            | Not sure                                 | 69     | 16.0       |
|                                                                                                    | No                                       | 24     | 5.6        |
|                                                                                                    | Yes                                      | 339    | 78.5       |
| Do healthy foods aggravate CVD conditions?                                                         | Not sure                                 | 44     | 10.2       |
|                                                                                                    | No                                       | 311    | 72.0       |
|                                                                                                    | Yes                                      | 77     | 17.8       |
| Proper exercise increases the risk of CVD:                                                         | Not sure                                 | 47     | 10.9       |
|                                                                                                    | No                                       | 357    | 82.6       |
|                                                                                                    | Yes                                      | 28     | 6.5        |
| Is feeling weak, lightheaded, or fainting a common sign of a heart attack?                         | Not sure                                 | 233    | 53.9       |
|                                                                                                    | No                                       | 64     | 14.8       |
|                                                                                                    | Yes                                      | 135    | 31.3       |
| Which of the following represents a CVD clinical picture? *                                        | Breathlessness                           | 204    | 47.2       |
|                                                                                                    | Chest, shoulder, jaw, neck, or back pain | 346    | 80.1       |
|                                                                                                    | Discomfort in the upper abdomen          | 87     | 20.1       |
| Do you think swelling in the lower extremities could be a clinical sign of heart failure?          | Not sure                                 | 222    | 51.4       |
|                                                                                                    | No                                       | 29     | 6.7        |
|                                                                                                    | Yes                                      | 181    | 41.9       |
| Walking is considered a sort of exercise that helps lessen the chance of developing heart disease. | Not sure                                 | 34     | 7.9        |
|                                                                                                    | No                                       | 5      | 1.2        |
|                                                                                                    | Yes                                      | 393    | 91.0       |
| How often do you think a serum cholesterol checkup should be done regularly?                       | Once every year                          | 286    | 66.2       |
|                                                                                                    | Every two years on average               | 53     | 12.3       |
|                                                                                                    | Not sure                                 | 85     | 19.7       |
|                                                                                                    | The Examination is not required.         | 8      | 1.9        |
| Can a proper diet prevent CVD?                                                                     | Not sure                                 | 23     | 5.3        |
|                                                                                                    | No                                       | 6      | 1.4        |
|                                                                                                    | Yes                                      | 403    | 93.3       |
| Do you believe that proper hypertension management can minimize the risk of CVD?                   | Not sure                                 | 47     | 10.9       |
|                                                                                                    | No                                       | 6      | 1.4        |
|                                                                                                    | Yes                                      | 379    | 87.7       |
| Do you believe that maintaining a normal blood sugar level can lessen the risk of CVD?             | Not sure                                 | 69     | 16.0       |
|                                                                                                    | No                                       | 9      | 2.1        |
|                                                                                                    | Yes                                      | 354    | 81.9       |

subset of the population that is more health-conscious or better informed about the risks of poor dietary habits.

Table 3 reveals significant insights into the knowledge and awareness of cardiovascular disease (CVD) and its associated risk factors among the 432 participants surveyed. Notably, a robust majority (85.4%) of respondents correctly identified hypertension as a major risk factor, indicating a commendable understanding of blood pressure's role in cardiovascular health. Similarly, the recognition of cigarette smoking as a risk factor was exceptionally high at 94.2%,

suggesting a strong awareness of the dangers associated with tobacco use. However, a closer examination reveals varying degrees of uncertainty regarding other risk factors; for instance, 26.4% of participants were not sure if diabetes is a significant risk factor, which highlights a critical gap in knowledge that could impact preventive health measures. The finding that over half (53.9%) were uncertain about whether feelings of weakness, lightheadedness or fainting are common signs of a heart attack further underscores the need for improved education around these symptoms.

Table 4: Shows awareness level of cardiovascular diseases and their risk factors score results

| Awareness               | Frequency | Percent |
|-------------------------|-----------|---------|
| High level of awareness | 322       | 74.5    |
| Moderate level          | 46        | 10.6    |
| Low level of awareness  | 64        | 14.8    |
| Total                   | 432       | 100.0   |

Table 5: Shows knowledge level of cardiovascular diseases and their risk factors score results

| Knowledge               | Frequency | Percent |
|-------------------------|-----------|---------|
| High level of knowledge | 211       | 48.8    |
| Moderate level          | 114       | 26.4    |
| Low level of knowledge  | 107       | 24.8    |
| Total                   | 432       | 100.0   |

Interestingly, the data also suggests that most participants (91.0%) recognize walking as beneficial for reducing heart disease risk, while an overwhelming majority (93.3%) believe a proper diet can prevent CVD. This demonstrates a positive inclination towards lifestyle changes that can mitigate risks.

The data presented in Table 4 provides a compelling insight into the awareness levels surrounding cardiovascular diseases and their associated risk factors within the surveyed population. Notably, an impressive 74.5% of respondents demonstrate a high level of awareness, indicating a robust understanding of cardiovascular health and the vital risk factors that contribute to disease prevalence. This substantial proportion suggests that effective educational programs, public health campaigns or community initiatives may have successfully disseminated crucial information, empowering individuals to make informed decisions regarding their health. In contrast, the data reveals that only 10.6% of participants possess a moderate level of awareness, while a concerning 14.8% reflect a low level of awareness concerning these critical health issues.

The data presented in Table 5 elucidates the knowledge levels pertaining to cardiovascular diseases and their associated risk factors among the surveyed population, revealing significant insights that warrant thorough examination. A noteworthy observation is that nearly half of the respondents, accounting for 48.8%, exhibited a high level of knowledge, suggesting a commendable awareness and understanding of cardiovascular health and its implications. This is a promising indicator of public engagement with health education initiatives, which are crucial in mitigating the risks associated with these prevalent conditions. Conversely, the presence of 26.4% and 24.8% of respondents demonstrating moderate and low levels of knowledge, respectively, highlights an area of concern; it underscores the need for targeted educational interventions aimed at enhancing awareness among those less informed about cardiovascular diseases. The fact that nearly 51.2% of participants possess only moderate to low levels of understanding signals a critical gap in knowledge that could potentially result in adverse health outcomes.

Table 6 shows that the awareness level of cardiovascular diseases has statistically significant relation to educational level ( $p$ -value = 0.0001). It also shows statistically insignificant relation to gender, age, marital status,

occupation, region of residence, daily life stress, smoking status, exercising, eating fruits and vegetables, eating fast food, family history of CVD, hypertension and diabetes.

Table 7 shows that the knowledge level of cardiovascular diseases has a statistically significant relation to marital status ( $p$ -value = 0.005), age ( $p$ -value = 0.024) and occupational status ( $p$ -value = 0.0001). It also shows a statistically insignificant relation to gender, educational level, region of residence, daily life stress, smoking status, exercising, eating fruits and vegetables, eating fast food, family history of CVD, hypertension and diabetes.

## DISCUSSION

Cardiovascular diseases (CVD) show an alarming growth pattern in Saudi citizens due to cultural and lifestyle changes [14]. Researchers have developed this study to investigate Saudi citizens' understanding of cardiovascular diseases and their risk elements while filling gaps in public health awareness [15]. The purpose of such assessments becomes evident through past research because a thorough understanding of CVD risk factors remains crucial for disease prevention [16].

Studies showed that participants demonstrated solid awareness of CVD risk factors at 74.5% but their knowledge regarding diabetes management and symptom recognition specifically remained inadequate because only 48.8% achieved high scores [15]. Research by Issa *et al.* confirmed these findings by showing that numerous participants missed understanding the importance of coronary artery disease symptom identification [17]. The research by Albugami *et al.* strengthens our findings by demonstrating the major discrepancy between public awareness and hands-on knowledge, which poses greater health threats to community members [18].

The research discovered an important relationship that exists between educational attainment and cardiovascular health knowledge. According to Wahabi *et al.* [19] study on CVD awareness patterns by age and gender, participants with higher education achieved better results in understanding cardiovascular disease risks. Education programs specifically designed to reach lower-educated demographics should become a priority, given that numerous people were unaware of lifestyle changes that reduce cardiovascular risks [14].

Table 6: Relation between awareness level of cardiovascular diseases and sociodemographic characteristics

| Parameters                             |                     | Awareness level of cardiovascular diseases |                 | Total (N = 432) | p-value* |
|----------------------------------------|---------------------|--------------------------------------------|-----------------|-----------------|----------|
|                                        |                     | High awareness                             | Moderate or low |                 |          |
| Gender                                 | Female              | 227                                        | 75              | 302             | 0.648    |
|                                        |                     | 70.5%                                      | 68.2%           | 69.9%           |          |
|                                        | Male                | 95                                         | 35              | 130             |          |
|                                        |                     | 29.5%                                      | 31.8%           | 30.1%           |          |
| Marital status                         | Single              | 133                                        | 44              | 177             | 0.940    |
|                                        |                     | 41.3%                                      | 40.0%           | 41.0%           |          |
|                                        | Married             | 173                                        | 59              | 232             |          |
|                                        |                     | 53.7%                                      | 53.6%           | 53.7%           |          |
|                                        | Divorced            | 10                                         | 4               | 14              |          |
|                                        |                     | 3.1%                                       | 3.6%            | 3.2%            |          |
|                                        | Widowed             | 6                                          | 3               | 9               |          |
|                                        |                     | 1.9%                                       | 2.7%            | 2.1%            |          |
| Age                                    | less than 23        | 81                                         | 33              | 114             | 0.454    |
|                                        |                     | 25.2%                                      | 30.0%           | 26.4%           |          |
|                                        | 23 to 35            | 82                                         | 24              | 106             |          |
|                                        |                     | 25.5%                                      | 21.8%           | 24.5%           |          |
|                                        | 35 to 45            | 66                                         | 27              | 93              |          |
|                                        |                     | 20.5%                                      | 24.5%           | 21.5%           |          |
|                                        | more than 45        | 93                                         | 26              | 119             |          |
|                                        |                     | 28.9%                                      | 23.6%           | 27.5%           |          |
| Occupational status                    | Student             | 107                                        | 33              | 140             | 0.474    |
|                                        |                     | 33.2%                                      | 30.0%           | 32.4%           |          |
|                                        | Employed            | 131                                        | 44              | 175             |          |
|                                        |                     | 40.7%                                      | 40.0%           | 40.5%           |          |
|                                        | Unemployed          | 45                                         | 22              | 67              |          |
|                                        |                     | 14.0%                                      | 20.0%           | 15.5%           |          |
|                                        | Retired             | 39                                         | 11              | 50              |          |
|                                        |                     | 12.1%                                      | 10.0%           | 11.6%           |          |
| Educational level                      | Primary school      | 0                                          | 1               | 1               | 0.0001   |
|                                        |                     | 0.0%                                       | 0.9%            | 0.2%            |          |
|                                        | Middle school       | 2                                          | 7               | 9               |          |
|                                        |                     | 0.6%                                       | 6.4%            | 2.1%            |          |
|                                        | High school         | 80                                         | 30              | 110             |          |
|                                        |                     | 24.8%                                      | 27.3%           | 25.5%           |          |
|                                        | Bachelor's degree   | 218                                        | 72              | 290             |          |
|                                        |                     | 67.7%                                      | 65.5%           | 67.1%           |          |
| Region of residence                    | Postgraduate degree | 22                                         | 0               | 22              | 0.391    |
|                                        |                     | 6.8%                                       | 0.0%            | 5.1%            |          |
|                                        | Northern region     | 26                                         | 6               | 32              |          |
|                                        |                     | 8.1%                                       | 5.5%            | 7.4%            |          |
|                                        | Southern region     | 3                                          | 2               | 5               |          |
|                                        |                     | 0.9%                                       | 1.8%            | 1.2%            |          |
|                                        | Central region      | 45                                         | 23              | 68              |          |
|                                        |                     | 14.0%                                      | 20.9%           | 15.7%           |          |
| Daily life stress is considered        | Eastern region      | 135                                        | 43              | 178             | 0.706    |
|                                        |                     | 41.9%                                      | 39.1%           | 41.2%           |          |
|                                        | Western region      | 113                                        | 36              | 149             |          |
|                                        |                     | 35.1%                                      | 32.7%           | 34.5%           |          |
|                                        | Stress-free         | 16                                         | 7               | 23              |          |
|                                        |                     | 5.0%                                       | 6.4%            | 5.3%            |          |
|                                        | Stressful           | 71                                         | 21              | 92              |          |
|                                        |                     | 22.0%                                      | 19.1%           | 21.3%           |          |
| Do you smoke?                          | Very stressful      | 18                                         | 4               | 22              | 0.437    |
|                                        |                     | 5.6%                                       | 3.6%            | 5.1%            |          |
|                                        | Moderate            | 217                                        | 78              | 295             |          |
|                                        |                     | 67.4%                                      | 70.9%           | 68.3%           |          |
|                                        | Yes                 | 25                                         | 11              | 36              |          |
|                                        |                     | 7.8%                                       | 10.0%           | 8.3%            |          |
|                                        | No                  | 284                                        | 97              | 381             |          |
|                                        |                     | 88.2%                                      | 88.2%           | 88.2%           |          |
| Do you exercise for 30 minutes a week? | Ex-smoker           | 13                                         | 2               | 15              | 0.210    |
|                                        |                     | 4.0%                                       | 1.8%            | 3.5%            |          |
|                                        | Once a week         | 69                                         | 33              | 102             |          |
|                                        |                     | 21.4%                                      | 30.0%           | 23.6%           |          |
|                                        | 2-3 times a week    | 85                                         | 21              | 106             |          |
|                                        |                     |                                            |                 |                 |          |

Table 6: Continued

| Parameters                                               |                                  | Awareness level of cardiovascular diseases |                 | Total (N = 432) | p-value* |
|----------------------------------------------------------|----------------------------------|--------------------------------------------|-----------------|-----------------|----------|
|                                                          |                                  | High awareness                             | Moderate or low |                 |          |
|                                                          |                                  | 26.4%                                      | 19.1%           | 24.5%           |          |
|                                                          | More than 5 times a week         | 29                                         | 11              | 40              |          |
|                                                          |                                  | 9.0%                                       | 10.0%           | 9.3%            |          |
|                                                          | I do not exercise                | 139                                        | 45              | 184             |          |
| Do you include vegetables and fruits in your daily diet? | Sometimes                        | 207                                        | 80              | 287             | 0.206    |
|                                                          |                                  | 64.3%                                      | 72.7%           | 66.4%           |          |
|                                                          | All the time                     | 102                                        | 25              | 127             |          |
|                                                          |                                  | 31.7%                                      | 22.7%           | 29.4%           |          |
| Do you eat fast food frequently?                         | I never eat vegetables or fruits | 13                                         | 5               | 18              |          |
|                                                          |                                  | 4.0%                                       | 4.5%            | 4.2%            |          |
|                                                          | Yes, I do                        | 63                                         | 23              | 86              |          |
|                                                          |                                  | 19.6%                                      | 20.9%           | 19.9%           |          |
|                                                          | Sometimes                        | 186                                        | 62              | 248             | 0.258    |
|                                                          |                                  | 57.8%                                      | 56.4%           | 57.4%           |          |
|                                                          | Rarely                           | 39                                         | 19              | 58              |          |
|                                                          |                                  | 12.1%                                      | 17.3%           | 13.4%           |          |
|                                                          | No, I don't                      | 34                                         | 6               | 40              |          |
|                                                          |                                  | 10.6%                                      | 5.5%            | 9.3%            |          |
| Family history of cardiovascular disease:                | No                               | 211                                        | 77              | 288             | 0.390    |
|                                                          |                                  | 65.5%                                      | 70.0%           | 66.7%           |          |
|                                                          | Yes                              | 111                                        | 33              | 144             |          |
|                                                          |                                  | 34.5%                                      | 30.0%           | 33.3%           |          |
| Have you been diagnosed with hypertension?               | No                               | 274                                        | 96              | 370             | 0.573    |
|                                                          |                                  | 85.1%                                      | 87.3%           | 85.6%           |          |
|                                                          | Yes                              | 48                                         | 14              | 62              |          |
|                                                          |                                  | 14.9%                                      | 12.7%           | 14.4%           |          |
| Have you been diagnosed with Diabetes?                   | No                               | 287                                        | 98              | 385             | 0.991    |
|                                                          |                                  | 89.1%                                      | 89.1%           | 89.1%           |          |
|                                                          | Yes                              | 35                                         | 12              | 47              |          |
|                                                          |                                  | 10.9%                                      | 10.9%           | 10.9%           |          |

\*p-value was considered significant if  $\leq 0.05$ 

Table 7: Relation between knowledge level of cardiovascular diseases and sociodemographic characteristics

| Parameters          |              | Awareness level of cardiovascular diseases |                 | Total (N = 432) | p-value* |
|---------------------|--------------|--------------------------------------------|-----------------|-----------------|----------|
|                     |              | High awareness                             | Moderate or low |                 |          |
| Gender              | Female       | 149                                        | 153             | 302             | 0.754    |
|                     |              | 70.6%                                      | 69.2%           | 69.9%           |          |
|                     | Male         | 62                                         | 68              | 130             |          |
|                     |              | 29.4%                                      | 30.8%           | 30.1%           |          |
| Marital status      | Single       | 103                                        | 74              | 177             | 0.005    |
|                     |              | 48.8%                                      | 33.5%           | 41.0%           |          |
|                     | Married      | 97                                         | 135             | 232             |          |
|                     |              | 46.0%                                      | 61.1%           | 53.7%           |          |
|                     | Divorced     | 5                                          | 9               | 14              |          |
|                     |              | 2.4%                                       | 4.1%            | 3.2%            |          |
|                     | Widowed      | 6                                          | 3               | 9               |          |
|                     |              | 2.8%                                       | 1.4%            | 2.1%            |          |
| Age                 | less than 23 | 61                                         | 53              | 114             | 0.024    |
|                     |              | 28.9%                                      | 24.0%           | 26.4%           |          |
|                     | 23 to 35     | 58                                         | 48              | 106             |          |
|                     |              | 27.5%                                      | 21.7%           | 24.5%           |          |
|                     | 35 to 45     | 48                                         | 45              | 93              |          |
|                     |              | 22.7%                                      | 20.4%           | 21.5%           |          |
|                     | more than 45 | 44                                         | 75              | 119             |          |
|                     |              | 20.9%                                      | 33.9%           | 27.5%           |          |
| Occupational status | Student      | 85                                         | 55              | 140             | 0.0001   |
|                     |              | 40.3%                                      | 24.9%           | 32.4%           |          |
|                     | Employed     | 86                                         | 89              | 175             |          |
|                     |              | 40.8%                                      | 40.3%           | 40.5%           |          |
|                     | Unemployed   | 22                                         | 45              | 67              |          |
|                     |              | 10.4%                                      | 20.4%           | 15.5%           |          |
|                     | Retired      | 18                                         | 32              | 50              |          |
|                     |              | 8.5%                                       | 14.5%           | 11.6%           |          |

Table 6: Continued

| Parameters                                               |                                  | Awareness level of cardiovascular diseases |                 | Total (N = 432) | p-value* |
|----------------------------------------------------------|----------------------------------|--------------------------------------------|-----------------|-----------------|----------|
|                                                          |                                  | High awareness                             | Moderate or low |                 |          |
| Educational level                                        | Primary school                   | 0                                          | 1               | 1               | 0.343    |
|                                                          |                                  | 0.0%                                       | 0.5%            | 0.2%            |          |
|                                                          | Middle school                    | 2                                          | 7               | 9               |          |
|                                                          |                                  | 0.9%                                       | 3.2%            | 2.1%            |          |
|                                                          | High school                      | 55                                         | 55              | 110             |          |
|                                                          |                                  | 26.1%                                      | 24.9%           | 25.5%           |          |
| Region of residence                                      | Bachelor's degree                | 141                                        | 149             | 290             | 0.155    |
|                                                          |                                  | 66.8%                                      | 67.4%           | 67.1%           |          |
|                                                          | Postgraduate degree              | 13                                         | 9               | 22              |          |
|                                                          |                                  | 6.2%                                       | 4.1%            | 5.1%            |          |
|                                                          | Northern region                  | 14                                         | 18              | 32              |          |
|                                                          |                                  | 6.6%                                       | 8.1%            | 7.4%            |          |
| Daily life stress is considered                          | Southern region                  | 1                                          | 4               | 5               | 0.072    |
|                                                          |                                  | 0.5%                                       | 1.8%            | 1.2%            |          |
|                                                          | Central Region                   | 26                                         | 42              | 68              |          |
|                                                          |                                  | 12.3%                                      | 19.0%           | 15.7%           |          |
|                                                          | Eastern Region                   | 95                                         | 83              | 178             |          |
|                                                          |                                  | 45.0%                                      | 37.6%           | 41.2%           |          |
| Do you smoke?                                            | Western Region                   | 75                                         | 74              | 149             | 0.295    |
|                                                          |                                  | 35.5%                                      | 33.5%           | 34.5%           |          |
|                                                          | Stress-free                      | 9                                          | 14              | 23              |          |
|                                                          |                                  | 4.3%                                       | 6.3%            | 5.3%            |          |
|                                                          | Stressful                        | 40                                         | 52              | 92              |          |
|                                                          |                                  | 19.0%                                      | 23.5%           | 21.3%           |          |
| Do you exercise for 30 minutes a week?                   | Very stressful                   | 16                                         | 6               | 22              | 0.143    |
|                                                          |                                  | 7.6%                                       | 2.7%            | 5.1%            |          |
|                                                          | Moderate                         | 146                                        | 149             | 295             |          |
|                                                          |                                  | 69.2%                                      | 67.4%           | 68.3%           |          |
|                                                          | Yes                              | 15                                         | 21              | 36              |          |
|                                                          |                                  | 7.1%                                       | 9.5%            | 8.3%            |          |
| Do you include vegetables and fruits in your daily diet? | No                               | 191                                        | 190             | 381             | 0.058    |
|                                                          |                                  | 90.5%                                      | 86.0%           | 88.2%           |          |
|                                                          | Ex-smoker                        | 5                                          | 10              | 15              |          |
|                                                          |                                  | 2.4%                                       | 4.5%            | 3.5%            |          |
|                                                          | Once a week                      | 52                                         | 50              | 102             |          |
|                                                          |                                  | 24.6%                                      | 22.6%           | 23.6%           |          |
| Do you eat fast food frequently?                         | 2-3 times a week                 | 56                                         | 50              | 106             | 0.222    |
|                                                          |                                  | 26.5%                                      | 22.6%           | 24.5%           |          |
|                                                          | More than 5 times a week         | 24                                         | 16              | 40              |          |
|                                                          |                                  | 11.4%                                      | 7.2%            | 9.3%            |          |
|                                                          | I do not exercise                | 79                                         | 105             | 184             |          |
|                                                          |                                  | 37.4%                                      | 47.5%           | 42.6%           |          |
| Family history of cardiovascular disease:                | Sometimes                        | 131                                        | 156             | 287             | 0.077    |
|                                                          |                                  | 62.1%                                      | 70.6%           | 66.4%           |          |
|                                                          | All the time                     | 73                                         | 54              | 127             |          |
|                                                          |                                  | 34.6%                                      | 24.4%           | 29.4%           |          |
|                                                          | I never eat vegetables or fruits | 7                                          | 11              | 18              |          |
|                                                          |                                  | 3.3%                                       | 5.0%            | 4.2%            |          |
| Have you been diagnosed with hypertension?               | Yes, I do                        | 48                                         | 38              | 86              | 0.307    |
|                                                          |                                  | 22.7%                                      | 17.2%           | 19.9%           |          |
|                                                          | Sometimes                        | 118                                        | 130             | 248             |          |
|                                                          |                                  | 55.9%                                      | 58.8%           | 57.4%           |          |
|                                                          | Rarely                           | 23                                         | 35              | 58              |          |
|                                                          |                                  | 10.9%                                      | 15.8%           | 13.4%           |          |
| Have you been diagnosed with Diabetes?                   | No, I don't                      | 22                                         | 18              | 40              | 0.528    |
|                                                          |                                  | 10.4%                                      | 8.1%            | 9.3%            |          |
|                                                          | No                               | 132                                        | 156             | 288             |          |
|                                                          |                                  | 62.6%                                      | 70.6%           | 66.7%           |          |
|                                                          | Yes                              | 79                                         | 65              | 144             |          |
|                                                          |                                  | 37.4%                                      | 29.4%           | 33.3%           |          |
| Have you been diagnosed with Diabetes?                   | No                               | 177                                        | 193             | 370             | 0.307    |
|                                                          |                                  | 83.9%                                      | 87.3%           | 85.6%           |          |
|                                                          | Yes                              | 34                                         | 28              | 62              |          |
|                                                          |                                  | 16.1%                                      | 12.7%           | 14.4%           |          |
| Have you been diagnosed with Diabetes?                   | No                               | 186                                        | 199             | 385             | 0.528    |
|                                                          |                                  | 88.2%                                      | 90.0%           | 89.1%           |          |
|                                                          | Yes                              | 25                                         | 22              | 47              |          |
|                                                          |                                  | 11.8%                                      | 10.0%           | 10.9%           |          |

\*p-value was considered significant if  $\leq 0.05$

Lifestyle practices displayed significant differences in our study results because 42.6% of participants lacked enough physical exercise and 57.4% regularly consumed fast food, which potentially leads to obesity and other CVD risk factors [15]. The data compiled by Alzahrani *et al.* [20] confirms that Saudi Arabia experiences widespread obesity alongside sedentary behaviors across different population segments, suggesting Saudi Arabia needs to evaluate and enhance behavioral change interventions. Research has established an essential link between poor dietary choices and non-communicable disease development, especially for cardiovascular diseases [21].

Our research revealed that numerous participants lacked any family history of cardiovascular diseases but the investigation uncovered concerning patterns of rising hypertension (14.4%) and diabetes (10.9%) rates in young adults [15]. The findings of this study confirm the research findings by Alhejely *et al.* [14], who warned about how lifestyle modifications affect health results while demonstrating the importance of creating public health strategies to manage these new risk factors. The primary care system fails to provide sufficient preventive care for diabetes management according to Al-Daghri *et al.* [22], which leads to increased cardiovascular burden for whole populations.

The study contained certain limitations during its execution. An assessment performed at one point in time hinders researchers from determining whether knowledge influences CVD risk factors among participants [19]. The participants could have displayed response bias regarding their lifestyle habits because they tended to report fewer negative behaviors than beneficial ones through the social desirability effect [23]. Additional studies should investigate cardiovascular disease knowledge among males because the current sample primarily consists of women, which might produce inaccurate results [15].

## CONCLUSIONS

The research reveals important knowledge and awareness deficiencies regarding cardiovascular diseases among Saudi citizens. Several risk factors receive high levels of recognition from the population, yet the current level of understanding falls short of enabling proper changes in personal health conduct. Public health programs of the future should implement educational programs that both teach and provide tools that will help people master cardiovascular health management through lifestyle changes. Specific interventions designed for at-risk populations have the potential to lower cardiovascular disease frequency as well as related mortality and morbidity rates within this population segment. Healthier living environments need to be developed through extensive community outreach efforts to fight the increasing cardiac disease prevalence in Saudi Arabia.

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## Conflicts of Interest

The authors declare no conflict of interest.

## Ethical Approval

After fully explaining the study and emphasizing that participation is optional, each participant gave their informed consent. The information gathered was safely stored and utilized exclusively for study.

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